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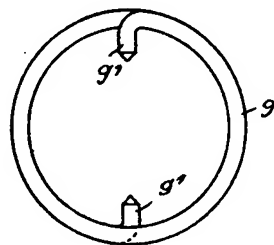
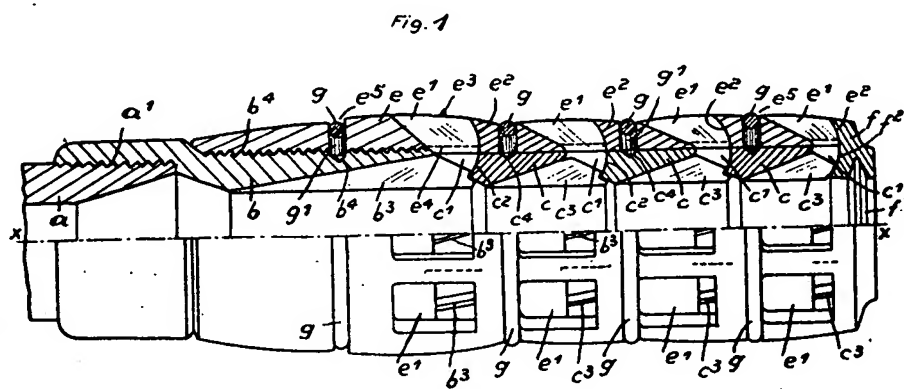
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COMPLETE SPECIFICATION

1 SHEET





PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in and relating to Recoil-absorbers for Firearms

We, NORBERT JULES ANDRÉ GALLIOT, of Avenue Gambetta, Vaucresson (Seine et Oise), and JEANNE ADRIENNE VICTORINE ANNA CHÂBLE, of 110, Boulevard Exelmans, Paris, both in France and both of French Nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to "muzzle checks" or recoil absorbers for firearms and of the type comprising one or more, convergent-divergent nozzles, fixed to the extremity of the barrel of the weapon, along the axis of the latter and intended to increase the kinetic energy of the gases which are thereafter diverted and rejected to the exterior by means of a fixed deflector system, single or multiple, generated by the revolution around the longitudinal axis of the weapon, of one or more arcs having their concavity turned towards the rear of the weapon, so that the energy of the gases which escape by this deflector system, is utilized to exert a force of traction in the contrary direction to that of the force producing the recoil of the weapon.

The invention relates more particularly to the construction and the assembly of the deflectors.

It is already known from our prior Patent Specification No. 445,821 to form the deflector system in part only by the curved rear face of the nozzles whilst an exterior part of the deflector system is constituted by the front face of the openings formed in the casing surrounding the nozzles and serving for the escape of the gases. In the construction described in that Patent Specification, the casing is fixed by being screwed and/or pinned upon the first nozzle, which is itself fixed upon the front extremity of the barrel of the weapon; according to one form of construction, the other nozzles are in turn fixed to the casing by tap-screws or pins. The interior or bore of the casing may be either smooth or screw-threaded; in the latter case, the several nozzles beyond the first are likewise screwed into the screw-threaded bore of the casing. In the con-

struction according to our said Patent Specification, the nozzles are provided in addition to internal helicoidal partitions or ridges, serving to maintain and accelerate the rotary movement of the gases around the axis of the weapon, produced by the rifling in the barrel, with longitudinal beaks intended to direct the flow of the gases towards the openings for the escape of the gases to the exterior; these beaks, suitably profiled or streamlined are arranged against the inner faces of the arms separating the gas-escape openings and they possess corresponding dimensions. These beaks serve moreover to regulate the spacing between the successive nozzles, but the exact position of the latter is determined by the tap-screws or pins fixing these nozzles to the casing.

The present invention relates to a recoil absorber of the above-mentioned type, in which the deflector system is formed in part only by the curved rear face of the nozzles, whilst an exterior part of the deflector system is constituted by the front face of the openings formed in the casing surrounding the nozzles and serving for the escape of the gases, and in which each of the nozzles is provided with internal helicoidal partitions or ridges, serving to maintain and accelerate the rotary movement of the gases around the axis of the weapon, produced by the rifling in the barrel; the first nozzle is again fixed upon the front extremity of the barrel and the casing is fixed by being screwed and/or pinned upon this first nozzle; the other nozzles are again mounted freely and successively one after another in the smooth bore of the casing; but according to the invention, the spacing between the successive nozzles is determined by prolongations of the internal helicoidal partitions or ridges, which are prolonged towards the front so as to contact with the part of the deflector formed in the rear face of the next nozzle in each case.

This improved arrangement provides a great simplification of the construction, for it allows the suppression of the beaks employed in the arrangement described in our said Patent Specification, such beaks

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being applicable with advantage only in cases where the arms separating the gas-escape openings have a helicoidal shape, in order the better to direct the gases
 5 towards escape-openings likewise of the helicoidal shape. On the contrary, the arrangement according to the present invention is applicable both in the case where the gas-escape openings and the
 10 arms separating these openings possess a helicoidal shape, and also in the case where they are located in a direction parallel to the longitudinal axis of the weapon. Moreover, by extending the
 15 internal partitions of the nozzles in this way, their action upon the gaseous current is increased as regards the maintenance and acceleration of the moment of rotation of this current around the longitudinal
 20 axis of the weapon, when these partitions are curved along a helix of the same hand as the rifling in the barrel.

The thrust of the gases is thus transmitted from one nozzle to the other: the
 25 assembly takes place very easily without any marking out, because there are no longer any longitudinal thrust-beaks which must be located opposite arms separating the openings for the escape of
 30 the gases, as is the case in the Patent Specification above mentioned.

In order to prevent any movement of rotation of the nozzles, by reason of the reaction of the gases upon the partitions
 35 on the internal face of these nozzles, there may be provided rings of steel wire, forming springs, which are seated in circular grooves or throats in the casing, opposite
 40 the nozzles, and these rings comprise beaks directed radially towards the interior, which pass through the casing and enter into corresponding holes in the nozzles.

The annexed drawing represents, by way of example, one form of carrying out
 45 the invention:

Fig. 1 shows the upper half in longitudinal axial section and the lower half in outside view a recoil-absorber according to the present invention, mounted at
 50 the front end of a barrel; and

Fig. 2 represents separately one of the fixing rings of the nozzles.

Upon the drawing, a designates the barrel of a firearm and b is a first convergent-divergent nozzle, screwed to the
 55 front extremity of the barrel. Three other convergent-divergent nozzles c c c , are shown mounted in front of the first, in succession one after the other, within the casing e . The front extremity portion f of the latter forms an obturator and comprises a cylindrical, axially arranged and circumferentially grooved conduit f' for the passage of the projectile. Annular
 60 passages or throats are designated at c^1 c^1 ,

these being generated by the revolution around the longitudinal axis $x-x$ of the barrel of the firearm, of the curved profile of the rear face c^2 f^2 , having its concavity turned towards the rear, of the
 70 nozzles c and of the obturator f . The nozzles, b c comprise internal, helicoidal partitions b^3 c^3 respectively, in such a manner as to constitute a rifling in
 75 prolongation of the rifling of the interior of the barrel of the firearm, and to continue the movement of rotation of the gases around the axis $x-x$; these
 80 helicoidal partitions b^3 c^3 of the nozzles have a pitch of the same hand as that of the rifling of the barrel, and this pitch preferably diminishes from the nozzle b towards the front of the weapon.

The gases thus animated with a movement of rapid rotation around the axis
 85 $x-x$ of the weapon, escape by the passages c^1 and are diverted and rejected towards the rear and pass out from the recoil absorber by escaping through openings e^1 formed in the casing e , passing between
 90 suitably profiled arms or partitions e^2 , for example chamfered upon their interior edge, as shown in broken lines at e^4 . The curved front face e^2 of each of the windows
 95 e^1 prolongs the curved rear face c^2 of each of the nozzles c and of the obturator f , so that the deflector system receiving the thrust of the gases and diverting the gases towards the exterior, is constituted in part
 100 by the rear face c^2 of the nozzles, and in part by the front face of the openings e^1 in the casing.

As shown, the casing e is fixed by being screwed at b^4 upon the first nozzle b , itself
 105 screwed at a^1 upon the barrel; the other nozzles c c c are located in succession one after the other in the smooth cylindrical bore of the casing e . Each of them bears upon the front extremities of the internal
 110 helicoidal partitions b^3 or c^3 of the preceding nozzle b or c respectively; for this purpose, these partitions are prolonged towards the front, so that their front beaks constitute abutments for the rear edge of the nozzle under consideration. It is the
 115 same for the obturator f at the front extremity of the casing e .

With this arrangement, the thrust of the gases is transmitted from the one deflector to the following one by these
 120 helicoidal partitions b^3 c^3 thus prolonged.

The reaction of the gases upon these helicoidal partitions, which would tend to cause the nozzles to rotate, is neutralized for the last three by the pressure of the
 125 gases upon the preceding deflectors; for the first nozzle, the pressure of the screwing is sufficient to prevent any rotation.

In order to be prepared for any eventuality, there may be formed upon the
 130

side face of the casing *e*, opposite each of the nozzles *b c*, a circular groove or throat *e'*, in which is engaged a steel wire ring *g* forming a spring; this ring *g* (Fig. 2) comprises radial beaks *g'*, turned towards the interior, which pass through suitable radial holes drilled in the casing and engaging in suitable holes *b'* or *c'* in the nozzle *b* or *c*, thus preventing any displacement of the latter. For assembly purposes, it is sufficient to open the ring a little so as to separate the beaks towards the exterior in order to bring the ring in place upon the casing; under the action of the elasticity of the ring, the beaks *g'* enter into the holes in the envelope and in the nozzle. A similar operation takes place for the dismantling.

There might also be formed in the rear face (*c' f'*) of each deflector, small recesses in which would be engaged the front extremities of the helicoidal partitions, in order to prevent a movement of rotation under the reaction due to the thrust of the gases upon these helicoidal partitions.

It is likewise well understood that this method of assembly might be applied to a "muzzle check" in which the internal partitions of the nozzles would be parallel to the axis of the weapon instead of being helicoidal.

In "muzzle checks" which are intensively cooled, like those used in aviation, and in which the mechanical qualities pass before endurance, the casing might be made of a light alloy, preferably having a high content of silicon or other alloy having a coefficient of expansion approximating to that of steel.

In this case, in order to lessen the fatigue of the arms situated between the openings for the escape of the gases (fatigue due to the obliquity of the helicoidal openings), these arms might be parallel to the axis of the weapon.

In all cases, the nozzles will be preferably of non-oxidizable steel, in order to facilitate the dismantling by sliding movements.

For the same reason, the nozzles may have their exterior lateral face slightly conical instead of being merely cylindrical, the small base of the cone being situated on the side of the front of the weapon; the bore of the casing would present a corresponding conicity.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

(1) A recoil absorber for firearms, of the type comprising one or several convergent-divergent nozzles, fixed to the extremity of the barrel of the weapon, along the axis

of the latter and intended to increase the kinetic energy of the gases, which are thereafter diverted and rejected to the exterior by means of a fixed deflector system, single or multiple, generated by the revolution around the longitudinal axis of the weapon, of one or several arcs having their concavity turned towards the rear of the weapon, in such a manner that the energy of the gases which escape through this deflector system is utilized to exert a force of traction in the opposite direction to that of the force producing the recoil of the weapon, and in which the deflector system is constituted in part only by the rear curved face of the nozzles, whilst the exterior part of the deflector system is constituted by the front face of the openings, formed in a casing surrounding the nozzles and serving for the escape of the gases, and in which the casing is fixed by being screwed and/or pinned upon the first nozzle, itself fixed upon the barrel of the weapon, whilst the other nozzles are positioned successively in the smooth bore of the casing, each of said nozzles being provided with internal helicoidal partitions or ridges, serving to maintain and accelerate the rotary movement of the gases around the axis of the weapon, characterized by the fact that the spacing between the successive nozzles is determined by prolongations of the internal helicoidal partitions or ridges, which are prolonged towards the front so as to contact with the part of the deflector formed in the rear face of the next nozzle in each case.

(2) In a recoil-absorber, according to claim 1, the arrangement which consists in employing, (in order to prevent any movement of rotation of the nozzles by reason of the reaction of the gases upon the partitions formed on the internal face of the nozzles) rings of steel wire, forming springs which are located in circular grooves or throats in the casing, opposite the nozzles, which rings comprise beaks directed radially towards the interior which pass through the casing and enter into corresponding holes in the nozzles.

(3) A form of construction of the recoil absorber according to claim 1, characterized by the fact that each prolongation of an internal helicoidal partition of one nozzle engages at its front extremity in a small corresponding recess formed in the rear face of the next nozzle, in order to prevent a movement of rotation of this nozzle under the effect of the thrust of the gases upon these helicoidal partitions.

(4) A form of construction of the recoil absorber according to any one of claims 1 to 3, in which the nozzles have their exterior lateral face slightly conical, with

the small base of the cone situated on the side towards the front of the weapon, the casing having a bore of corresponding conicity.

Dated this 3rd day of August, 1937.

For the Applicants,

FEENY & FEENY.

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